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A Comparative Study between Upgraded Holstein Freisian Heifer (Repeat Breeder) and Bulls for Beef Production at BAPARD, Gopalganj, Bangladesh

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ABSTRACT: The Research work was conducted to find out the comparison between Heifer(Repeated Breeder) and Holstein-Friesian Bulls for Beef Production and Extension for Rural people of beef cattle Balanced ration on the performance of upgraded Heifer at BAPARD cattle farm in Bangladesh. For this purpose, twelve Cattle(4Heifers,8 Holstein Friesian) of average 32 months of age and 210 kg live weight were divided into three equal groups during 16 January2020 to 15 May 2020. The Same Beef Cattle Fattening Balanced rations such as: T_1, T_2 and T_3(Heifer)were randomly distributed into 3 groups for 3 same rations.After 24monthsof aged more than 3 times months the Heifers were inseminated but did not conceived prolonged show again estrus.Animals can be breed both naturally by own bull and artificial insemination. These Heifer were repeated Estrus and Breeding as they are as Repeated Breeder .For this reason ,these 4 Heifers were decided to rear and investigate the beef production as beef fattening program without culling the farm.The obtained information was collected, stored and coded accordingly using Microsoft Excel-2013 to WASP-1.0 (Web Agri. Stat Package) by ICAR (Central Coastal Agricultural Research Institute) for analysis. Then the data were analyzed through Completely Randomized Design (CRD). Significant mean values were tested with DMRT (Duncan's Multiple Range Test)
The obtained information was collected, stored and coded accordingly using Microsoft Excel-2013 to WASP-1.0 (Web Agri. Stat Package) by ICAR (Central Coastal Agricultural Research Institute) for analysis. The results were expressed in body weight gain with P value for Chi-square test. Significances was determined when $P<0.05$.The results found that the average daily live weight gains of three groups was 350g, 360g and 375g respectively, which were not differ significantly ($P<0.05$). Daily DM intake was significantly higher in T_3(11.1 g/head/day) compared to $T_1$and T_2 ($P<0.05$), but the digestibility found thesame treatments. Feed conversion ratio (FCR) was significant higher in T_1 (10.1) but interestingly, cost of per kg live weight gain was the lowest in T_3 (225 BDT) compared to other two treatments ($P<0.05$). Therefore, considering the above factors, it might be recommendedthatHeifer(Repeated Breeder)as HFP with beef Balanced Ration would be the appropriate Beef Fattening program for meat production and extension for Rural developmentas income generating entrepreneurship in reducing core Poverty in Bangladesh.

Keywords: Heifer (Repeated Breeder),Beef Balanced Ration, BAPARD, Core Poverty,HFP(Heifer Fattening Program).

I. INTRODUCTION

Bangladesh is a rural Agricultural developing mixed Economic country.Beef in Bangladesh usually comes from the unproductive aged bullocks,cows,culled Animals and Heifer not Conceived or Repeated Breeders of the farm animals . Livestock constitude an important part of the wealth of a country in providing meat,milk,manure,leather,draft power etc. to the vast majority of the people.Livestock is one of the most important components of agriculture that contributes about 6.5% of gross domestic products (GDP) and 14.21% of total foreign exchange earningsin Bangladesh (DLS, 2017, Mustafa et el., 2020). Livestock plays avital role in the traditional agriculture and largely subsistence economy of Bangladesh (Barman et al., 2017; Baset et al., 2003; Begam et al., 2007; Rahman et al., 2002). The rural poor farmers largely depend on livestock (especially

on small ruminants) for their survival (Ahmed, 1992). Cattle of Bangladesh is an inseparable and integrated part of the agricultural farming systems and it ranks 12th in the world and 3rdin the Asian countries (Alam, 1995). Feeds and strategy of feeding are the important factors for livestock development. The feeding practice of livestock of Bangladesh is very much traditional and conventional (Tareque, 1991; Rahman et al., 1997, 1998 and 1999). Bangladesh has a higher cattle population than any other countries of European Economic Community (Allen, 1990) and distributed with a greater density (2.6 cattle and buffalo heads per hectare) compared to other Southeast Asiancountries (Assaduzzaman, 1996).Beef fattening is the intensified feeding of cattle to obtain the greatest quantity of high quality meat. It can also compensate the deficiency of protein and energy of the cattle which promote weight gain. The cattle population of Bangladesh commonly suffers in malnutrition as well as beef fattening need energetic diet. Nutrient supplementation to the growing cattle enhances muscle development, meat quality and marbling. It's also a tool for livelihood improvement and income generation of rural poor. Beef fattening is an emerging sector for employment and income generation for the rural poor, especially landless, destitute and divorced women. Cattle fattening is an effective tool for poverty alleviation for the rural poor. Cattle fattening for beef production has become an important business of the small farmers in Bangladesh. One of the advantages of the cattle fattening by the rural farmers is that they use locally available cattle feed resources during the Eid festival. In recent years the women farmers of Bangladesh have been involved and sustained beef fattening program in rural areas of the country (Ahmed et al., 2010; Begum et al., 2007; Islam et al., 2012,Mustafa et al 2020). Green fodder along with concentrate supplementation enhances the growth performances of cattle. Ruminant animals primarily depend on microorganisms available in the rumen to digest roughages (cell wall polysaccharides) and other feedstuffs to produce volatile fatty acids (VFA) and other organic acids. Various types of microorganisms from different species (bacteria, protozoa, fungi) are involved in the ruminal digestion process to digest the fibrous materials and other feed ingredients. There is a scarcity of green grass and rice straw might be the major feed resource for the livestock production in Bangladesh (Molla etal.,2009). Straw can be used through urea treatment along with molasses that increase the digestibility of straw and very much effective for the growth and also for fattening (Baset et al., 2002; Mazed et al., 2004; Kawsar et al., 2006; Sarkar et al., 2008). Carbohydrates represent the most dominant fractions of cattle diets such as starch, cellulose, hemicellulose, pectin, arabans and xylans (Allen and Piantoni, 2014; Das et al., 2015). The digestion and utilization of carbohydrate by cattle varies according to type of carbohydrate and physiological condition of the animal (Noziere et al., 2010). Forages composed up to 40 to 100% of the cattle diet and are vital for maintaining health and productivity of animal (Prins and Kreulen, 1991). Cattle need minimum of 16% CP in their ration for their optimum growth, production, and reproduction (NRC, 1990), but in the conventional feeding system cattle gets a very low amount of CP (Khalek et al., 2004). The true protein feeds are very much expensive and so rural farmers can't supply high protein source feeds to their cattle. On the other hand urea is a NPN (non-protein nitrogen) substance which can provide 16% CP to the ruminant animals and ruminant can efficiently utilize urea. So, incorporation of urea into the ruminant's diet along with a higher carbohydrate source can provide sufficient protein and energy required for the ruminants. These urea treated feedsenhance the growth, production, and reproduction of the ruminants (Mathur and Sharma, 1985) and such type of feed materials can be used for beef fattening. Cattle fattening for beef production has become an important business of the small farmers in Bangladesh. The Department of Livestock Services (DLS) has taken beef fattening as an action program to generate income for the rural poor farmers. Detailed study is needed covering different districts of Bangladesh to recommend cattle fattening programs for the rural poor farmers as an income generating activity(DLS, 2017).

In this context, the present comparative study between Heifer (Repeated Breeder)and Holstein Friesian Bulls for beef production was conducted by the Livestock Department of Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD) at Kotalipara, Gopalganj in Bangladesh.After 24 months of agedthe heifers were inseminated more than 3 times but did not conceive prolonged show again estrus.Heifer can be bred both naturally by own bull and artificially.These heifers were repeatedly breeding as they are Repeated Breeders .. In this perspective, the research was designed with balanced beefrationof three groups. This research was carried out due to a part and parcel of BAPARD training and research implementation with following objectives: To determine the i) growth rateofHeifers withsameformulated rations, ii) FCR of upgraded Holstein Friesian bulls with same formulated rations and iii) cost of meat production of Heiferand bulls with same formulated Balanced Beef Ration and iv) comparison between Heifer and Holstein Friesian Bull(HFP) .

II. METHODOLOGY

The study was conducted at BAPARD Cattle Farm in Kotalipara, Gopalganj, Bangladesh for a period of 4 months from 16 January 2020 to 15 may2020. The animals were selected and bought from the Cattle Breeding and Dairy Farm, Bogra under DLS (Directorate of Livestock Services). Twelve cattle of almost32 months of age and an average body weight of 210 kgwere selected from the breeding herd. At the beginning of

the experiment the animals were weighted at morning before offering any types of feed by using Shaeffer's formula and the measurement was continued throughout the experiment at morning once weekly.

Body weight $W = \frac{L \times G2}{300}$ ibor, $W = \frac{L \times G2}{300 \times 2.2}$ kg

Here, L= Length of the body starting from point of the shoulder to the point of buttock in inch. G=Heart girth in inch by dividing with 2.2 to get the reading in kg (Banerjee, 1998). Figure 1a and 1b shows technique of body weight measurement

These 12 cattle were randomly distributed into 3 groupsfor 3 same formulated diets (treatment) and each group consists of 4 cattle (replication). Animals of group A were bulls,HF(T_1), animals of group B,HF were supplied beef balanced rationwithsame(T_2), and animals of group C were supplied same ration of Heifers(T_3) which were produced in BAPARD campus. The proportion of feed ingredients for concentrate mixture was selected to fulfill the nutrient requirements of the experimental bulls (Table 2). Individual recordsof these cattle were kept with same feeding and watering system atBAPARD cattle farm in KotaliparaUpazila, Gopalganj, Bangladesh.

Table 1. Design of experiment

Group of Animal	**Treatment**	**Formulated diets**
Group A(4HF Bull)	T_1	Beef balanced ration
Group B(4HF Bull)	T_2	Same ration
Group C(4 Heifer)	T_3	Same ration ,

Table 2. Concentrate mixture for the experimental diet 1 (T_1)

Sl.	**Feed Item**	**Percentage (%)**
1	Wheat Bran	17%
2	Crushed maize	10%
3	Rice Polish	15%
4	Mustard Cake / Soybean	25%
5	DCP	2%
6	Molasses,pulse crushed	1% + 24%
7	Lime Stone	1%
8	Salt	1%
9	Premix (D.B.)	0.10%
		100%

Quarantine and Deworming of the upgraded bulls: All cattle kept under quarantine for 14 days period prior to fattening and then dewormed with anthelmentics before the starting of feeding experiment. One (1) antiworm (Bol. Endex) bolas was applied for 41-70kg body wt. to all of the cattle and sufficient amount of water was supplied during this period for better effectiveness of that drug..

Feed supply per day per Animal according to body weight

200kg and more :Straw;5-6kg,Concentrate ;4.0-4.5kg and Green Grass ;8-12 kg

Feeding and digestibility trial: The formulated diets were fed *adlibitum* and calculated the total DM intake of the diets of the respective dietary components was maintained throughout the feeding period. The animals were fed twice daily once at 7.00 h and again at 15.00 h. Clean and fresh water was offered twice daily to all animals. The same amount of mineral supplements (di-calcium phosphate and salt) was supplied to all treatment groups to minimize mineral deficiencies. Daily feed offered to and refused by an individual animal were recorded and the animals were weighed every seven days for a total period of 120 days including a seven days digestibility trial after sixty days of growth trial. The digestibility of the diets was calculated by the following formula:

% digestibility = $\frac{Intake - excreted}{Intake} \times 100$

Analysis of Cost of Feeding: Cost of feeding was analyzed considering the present market price of feed ingredients and cost of diets shown in Table 3.

Table 3. Price of the Ingredient of the Experimental Diets

Feed ingredients	**Price (TK/kg)**	**Price (Dollar/kg)**
Wheat bran	32.00	0.40
Crushed corn	24.50	0.31
Rice polish	16.00	0.20
Green grass	10.00	0.13
Rice straw	11.00	0.14
Mustard plant	10.00	0.13
Urea	30.00	0.38
Molasses	28.00	0.35

Statistical Analysis

The obtained information was collected, stored and coded accordingly using Microsoft Excel-2013 to WASP-1.0 (Web Agri. Stat Package) by ICAR (Central Coastal Agricultural Research Institute) for analysis. Then the data were analyzed through Completely Randomized Design (CRD). Significant mean values were tested with DMRT (Duncan's Multiple Range Test)

The obtained information was collected, stored and coded accordingly using Microsoft Excel-2013 to WASP-1.0 (Web Agri. Stat Package) by ICAR (Central Coastal Agricultural Research Institute) for analysis. The results were expressed in body weight gain with Pvalue for Chi-square test. Significances was determined when $P<0.05$.

III. RESULTS AND DISCUSSION

The effects of different formulated diets on the performances of upgraded Holstein Friesian bullswere shown in Table 4. Initial body weight was little bit different at three diet treated groups and final body weight after 4 months of experimental period was also different ($p>0.05$) in T_1, T_2 and T_3. The average daily live weight gains of three groups were320g, 315g and 314g respectively. A little higher body weight gain was found in T_1 but the differences were not significant at different treatment groups. Mustafa et al. (2020) found a higher body weight in upgraded Holstein bulls with the similar types of feeding strategy. This might be due to higher genetic potentials of Holstein cattle. Comparatively lower feed intake was found in T_1 (4.4 kg/head/day) than in T_2(7.2 kg/head/day) and T_3 (8.1 kg/head/day) respectively. The digestibility of the three formulated diets was 85, 74 and 72% for T_1, T_2 and T_3 respectively. A higher digestibility of DM (85%) was found in concentrate based diet (T_1) compared to the digestibility of T_2(74%) and T_3 (72%).The differences were significant ($p>0.05$)in T_1 with T_2 and T_3, but no significant difference was found between T_2 and T_3. Ruminant animals depend on plant source feeds that are digested anaerobically in their rumen through microbial enzymes. Volatile fatty acid (VFA) and other organic acids are the primary energy sources in rumen fermentation. Microbial fermentation in the rumen also produces waste products such as methane (CH_4) and carbon dioxide (CO_2) (Kim et al., 2012; Rahman et al., 2013). Rahman et al. (2013) examined the VFA (acetate, propionate and butyrate) production pattern of different types of feed ingredients and found that a comparatively higher propionate production from energy and protein feeds compared to forages. On the other hand, acetate production was comparatively higher in forages (63.16%) than energy (60.19%) and protein rich (60.79%) feeds. Higher acetate: propionate ratio was found in forages compared to energy and protein feeds might be due to presence of structural carbohydrates (cellulose, hemi-cellulose) in forages. Forages contain more acid detergent fiber (ADF) and neutral detergent fiber (NDF) that helps to increase A:P ratio during anaerobic fermentation, and the molar proportion of different fatty acid production depends on the structural composition of the feed ingredients. Readily degradable carbohydrates produced relatively higher propionate as compared to acetate, and cell wall containing fibrous carbohydrate (cellulose) produced more acetate than propionate. Rahman et al., (2012) formulated a ration with selected feed ingredients to optimize production by reducing CH_4 emissions from ruminant(Khandakeret .al.1993,kim et al.1990)

Table 4. Effect of same formulated diets on the performances of Holstein Friesian upgraded bulls and Heifer

Parameters	Group of Animals and treatments			Level of Significance
	T_1	T_2	T_3	
Initial body weight (kg)	220^b	210^a	255.5^a	*
Final body weight (kg)	330.25^b	330.75^a	340.5^a	*
Body weight gain (kg/day)	0.330	0.335	0.325	NS
Feed intake (kg/head/day)	16^b	17^a	15^a	*
Digestibility (%)	83^a	81^b	85^b	*
FCR (kg feed/live wt. gain)	8.23^b	8.30^a	8.20^a	*
Cost of meat production (TK/kg live wt.)	255^a	250^a	225^b	*

Figures followed by same letter (s) within a row do not differ statistically NS means not significant; *means significant at 5% level of probability

The most effective FCR was found in T () compared to T_2 (4.30) and T_3 (4.08). Concentrate based diet (T_1) showed a significant difference ($p>0.05$) with T_2 and T_3 but, there was no statistical difference between T_2 and T_3. The feed cost of producing one kg live weight was calculated to be 135, 137 and 85 TK respectively for the three diets.The cost of producing beef cattlewas significantly differentp>0.05 in T_3compared to T_1 and T_2. Considering the FCR and cost of producing per kg live weight, a beef diet of green grass is the comparatively appropriate diet for the floodplains area for heifer. Forage to concentrate ratio (F:C) may alter dry matter intake (DMI) in ruminants since DMI is associated with the amount of neutral detergent fiber (NDF) in diet, the digestibility of NDF, the proportion of NDF that is slowly digested, lignin contents and the passage rate of the undigested feed residues from the digestive tract (Oba and Allen, 1999). In addition to NDF, the other cell wall components being the dominant part (55 to 60%) of the forage materials and having variable fractional passage rate may also limit DMI by occupying gut fill (Wilkins, 2009). Forages represent the most dominant parts of cattle diets that are the source of starch, cellulose, hemicellulose, pectin, arabans and xylans (Das et al., 2015; Rahman et al., 1998). Forages comprise up to 40 to 100% of the cattle diet and are vital for maintaining health and productivity of animal (Prins and Kreulen, 1991). The higher the fiber content of the forage materials, the lower is the digestibility and the nutritive value (Baset et al., 2002; Mazed et al., 2004; Refat and Yu, 2016). Meat and meat products Marketing in future has a great opportunity(Allen D 1990)However, fiber plays an important role in rumen development and voluntary feed intake (Khan et al., 2011). Mazed et al (2014)studied on Heifer and found that 415 gm body weight gain per day per animal that was revealed the present study.

IV. CONCLUSION

Based on the above study it may be concluded that cost of per unit beef production was the lowest in Heifer beef production. Although the DM intake and body weight gain was higher and digestibility was lower in T_3, it seems to be profitable for rural poor people who were engaged in beef fattening program and problem facing regarding repeated Breeder Heifer.Therefore, considering all of these factors Heifer based beef fattening program was found suitable in compare to Holstein Friesian bulls in reducing core poverty in Bangladesh.

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